

# Groundwater Protection Strategy

**Report of the Groundwater Protection Strategy Work Group:  
Requested by the Director of the Montgomery County  
Department of Environmental Protection**



A strategy to protect public health and the integrity of groundwater and of surface watersheds.

*Montgomery County, Maryland  
November 2001*

## **WHY GROUNDWATER PROTECTION IS IMPORTANT**

### **People Drink the Stuff**



Each day nearly 80,000 people (living on 50 percent of the land) in Montgomery County rely on groundwater as their sole source of drinking water. If that groundwater should become contaminated, that event would not just be an abstract concept, it would mean the loss of quality of life, decreased property values, and potential illness. The majority of Montgomery County citizens who depend on groundwater as a source of drinking water reside in areas that are part of, or adjacent to, the Agricultural Reserve (see Appendix 1). These areas are not intended to receive public water and sewer service. However if the sources of rural drinking water become contaminated, it may be necessary to extend public water services for great distances into these sparsely populated areas. The cost of such service extension would be disproportionately high and would burden the existing customers of the public utilities with higher rates. The environmental and

economic costs of extending water services should be avoided if possible. A Groundwater Protection Strategy is essential to ensure a clean and reliable source of drinking water.

### **The Stream Ecology that Provides Montgomery County with its Biodiversity Requires a Reliable, Consistent, High-Quality Baseflow.**

The County's streams support a wide variety of life and provide the County with a rich environmental diversity. Everything, -- from the insects, fish, and amphibians that live in the streams, to wildlife and people that require the water for drinking,-- needs these streams to have a reliable, high-quality, predictable baseflow. During the summer, groundwater is a stream's primary source of cool water and stream flow. Normal dry conditions may lower stream flows, cause intermittent streams to dry up, and relocate or eliminate certain springheads. However, overuse or misuse of groundwater may exacerbate these problems.



### **The Public's Misconceptions About Groundwater Has Led to Conflict**

Over the last five years the public's misconceptions about the quantity, quality and use of our groundwater resources has seriously impacted Montgomery County's citizens and potentially threatened the health of people and the environment. Dramatic examples include:



1. Disputes have occurred among public factions that have different interests and levels of information. In the cases of the Bucklodge Golf Course/Forest, the South Germantown Recreation Park, and the Hampshire Greens Development, the development and recreation needs of a

growing suburban county competed against the interests of longstanding rural communities anxious about changes in their way of life.

Public debate about the pros and cons of these development issues intensified during 1997-1999 when the Washington metropolitan region experienced one of the most severe droughts in the last century. The Department of Environmental Protection (DEP) measured water-table levels in the County and found them to be as much as 15 feet below seasonal norms. Some of the older, shallow, water table wells in rural parts of the County were reported to have gone dry.

2. Complications emerged in the development of both the Montgomery County Correctional Facility (located in Clarksburg) and the Silver Spring Redevelopment projects due to the presence of groundwater contamination. This contamination resulted from historic disposal practices and releases from commercial operations over a period of close to 40 years and created delays and added to the costs of these facilities.



Anticipated future conflicts involving the potential contamination of groundwater include:

- the proposed Techway Highway (linking Northern Virginia and Montgomery County while crossing the Agricultural Reserve),
- the Poolesville community wells, as the siting of future wells having sufficient capacity and cleanliness to support the community water system may become more difficult, and



- nutrient loading of the streams from baseflow, particularly as the Total Maximum Daily Load regulations and enforcement become more rigorous.
3. Difficulties were endured by County citizens during the 1999 ice storm due to the lack of an adequate automated database that could delineate areas where users are dependent upon groundwater resources. During that event electric utilities tried to prioritize the restoration of electrical service to those homes that were dependent on well water, but could not do so because a suitable Geographic Information System (GIS) map to locate these homes does not exist. This delayed the restoration of electrical and consequently water service to many homeowners.

## **WHAT ARE WE GOING TO DO TO PROTECT THE GROUNDWATER?**

In April, 2001, DEP began working with interested community organizations and individuals to define the issues of concern and to develop a comprehensive groundwater protection strategy. The Groundwater Protection Strategy Work Group was established to accomplish these objectives.

Individuals who were invited to join the Work Group represented a wide cross-section of interests, including government, commercial, scientific, consulting, trade and citizen organizations concerned with environmental issues.

The following are the members of the Work Group and the organizations that they represent:

<b>Member:</b>	<b>Representing:</b>
Jay Beatty	Department of Permitting Services
Martin Chandler	Washington Suburban Sanitary Commission
Barbara Cook	GeoEnvironmental Group, LLC
Jeremy Criss	Department of Economic Development - Agriculture
Mark Duigon	Maryland Geological Survey
Neal Fitzpatrick	Audubon Naturalist Society
John Grace	Maryland Department of the Environment
Dean Graves	Mid-Atlantic Association of Golf Course Superintendents
Peter Karasik	Department of Public Works and Transportation
Doug Katz	Meeting Facilitator – Wasserman-Katz
Keith Levchenko	County Council
Ken Medearis	DEP staff
Delores Milmoie	For A Rural Montgomery
Matt Nisenoff	Council President Blair Ewing
Stavros Papadopoulos	S. S. Papadopoulos & Associates, Inc.
Ellen Scavia	Department of Environmental Protection
Shobhana Sharma	Water Quality Advisory Commission
Nazir Baig	Maryland National Capital Park and Planning Commission
Walter Wilson	County Attorney

Between April 30, 2001 and October 15, 2001, the Work Group held 7 - two-hour meetings to discuss the issues of concern and develop the recommendations regarding a County groundwater protections strategy that are presented in this report.

Once assembled the Work Group crafted the following Mission Statement:



## **The Work Group Mission Statement:**

*The Work Group will help establish a Groundwater Protection Strategy for Montgomery County that will protect public health and the integrity of groundwater and of surface watersheds from the effects of groundwater contamination and loss of recharge. The implemented strategy will achieve this by:*

- 1. Establishing a baseline of the existing condition of groundwater resources*
- 2. Establishing policies, guidelines and regulations that minimize future contamination of groundwater and loss of recharge and that assure public and private projects will be in full compliance with applicable environmental laws and regulations.*

## **THE WORK GROUP REPORT**

In keeping with the Work Group's mission, this report of findings and recommendations for the establishment and implementation of a Montgomery County Groundwater Protection Strategy is submitted to the Director of the Department of Environmental Protection.

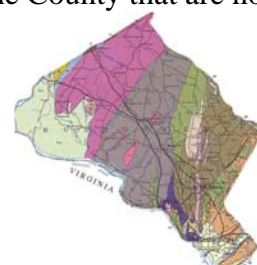
This report is organized into three sections:

1. Montgomery County, The Setting describes Montgomery County; its physical attributes, geology, and demographics, and how these are important in developing a Groundwater Protection Strategy;
2. Issues describes the policies and data reviewed by the Work Group, and presents the Work Group's recommendations resulting from their findings and deliberations;
3. Appendices contain Tables and Figures, an analysis of other comparable jurisdictions' groundwater protection legislation, and other background material.

### **Montgomery County, The Setting**

Most of Montgomery County is located within the Piedmont physiographic province. The underlying geology is mostly Paleozoic metamorphic rocks. Areas of the County that are not geologically similar include the following:

1. The western-most portion of the County surrounding the town of Poolesville; this area is situated on mostly Triassic sedimentary rock (New Oxford formation sand/siltstones);
2. The eastern-most edge of the County bordering Prince George's County; this area is situated on Cretaceous age coastal plain sedimentary rock (Potomac Group sediments).

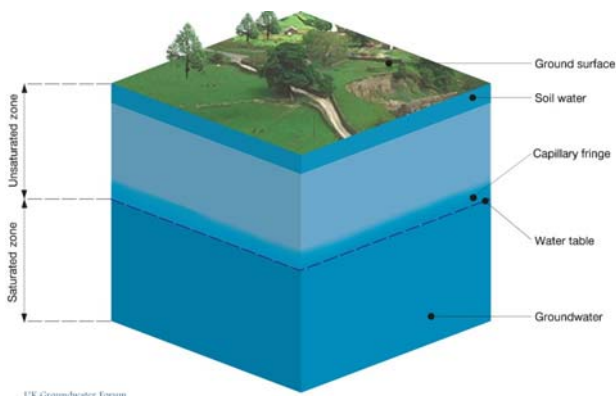


One item of note in Upper Montgomery County is the existence of the Piedmont Sole Source aquifer. The Sole Source Aquifer (SSA) designation is applied by the United States Environmental Protection Agency (USEPA) to an area with no alternate source of drinking water

and provides an additional level of protection to the community through the requirement of USEPA review of all federally funded projects within an SSA.

Knowledge of the geology is vital to the understanding of the County's groundwater conditions and therefore in establishing adequate resource protection measures. The County's geology determined the method that was recommended by the Work Group to establish baseline conditions for the County (see the Issues section). Appendix 2 provides a geologic map of Montgomery County. The map shows the principal geologic groups discussed above.

The climate of the County is typical for Mid-Atlantic states, with warm summers and mild winters that have only 23.5 inches of snow per year. (For calculating annual precipitation, an average of 1 foot of snow is approximately equal to 1 inch of rain.) Normal precipitation for the area averages 41.1 inches per year. Recently, during the years 1997-1999, precipitation was much lower than normal, which resulted in drought conditions, a lowered water table (3 to 15 feet lower than normal in County monitored wells) and the implementation of some mandatory State-imposed water-use restrictions for conservation purposes.



UK Groundwater Forum

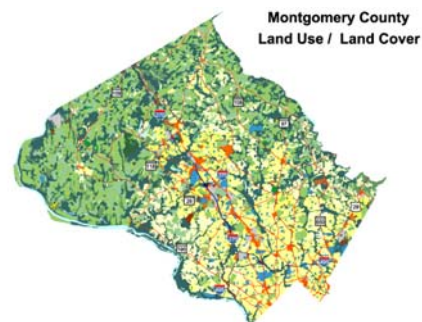
Changes in climatic conditions cause changes local water budgets. Water budgets are the balance between water that comes into and goes out of a watershed. Water usually enters via precipitation, and by surface water and groundwater inflow, and leaves via evaporation, consumption by plants, animals or man, and by groundwater and surface water outflow.

Knowledge of the County's precipitation (both normal and drought) is vital in creating water budgets.

The County covers almost 500 square miles and the topography is rolling foothills, typical of the eastern Piedmont. Within this area there are 45,349 acres (about 70 square miles) of parkland, and an additional 86,917 acres (about 140 square miles) of farmland giving the County a wide mixture of urban, suburban and rural environments.

Maps attached as appendices show development features of the County, for example:

- The maps of the Agricultural Reserve and Special Protection Areas (Appendices 1 and 3), identify areas that already restrict certain types of development. These are areas that may prove to be more easily protected. It is worth noting that some of the farmland in the Agricultural Reserve is actively farmed. According the Department of Economic Development, about 60,510 acres (about 90 square miles) are actively farmed and much of the rest is either forested, pasture, or developed.



- The map of Forest Cover (Appendix 4) shows that approximately 28 percent of Montgomery County is covered by forest. Use of this map in conjunction with topographic and wetlands maps, could lead to identification of areas of groundwater recharge or discharge.

- The maps of Impervious Surface – Buildings, Parking Lots, and Roads (Appendices 5



through 7), highlight density of development and hence areas where recharge to groundwater is expected to be minimal. A greater incidence of groundwater contamination would also be expected in areas of high-density development, especially if they include commercial and industrial facilities.

Impervious surfaces could also dramatically reduce infiltration to groundwater and thereby reduce stream baseflow, or increase surface water runoff during storms.

- The maps of Public Water and Sewer, (Appendix 8), shows where groundwater is not being used for drinking water. However, even within the area served by public water and sewer, there are still users of groundwater. Therefore, the public water and sewer information must be compared with the map of groundwater wells (Appendix 9) to determine where contamination potential is a long-term ecological concern rather than an immediate, direct human health concern.
- A map of Contaminated Sites in Montgomery County, when available, will show us where groundwater may already be contaminated. It is estimated from data obtained from the Maryland Department of the Environment that there are some 373 such sites in Montgomery County. These sites range from underground storage tank leaks (mostly gasoline stations and home heating oil spills) to hazardous waste contamination sites (identified from the USEPA National Priorities List). Regulatory agencies have determined that the course of action for many of these sites is to leave existing contamination in place. This information, when combined with the Public Water and Wells maps, will help the County to prioritize areas of protection for those sites where there is less of a risk of existing contamination and no clean-up requirements.



Knowledge of the County's demographics and current development features is vital for developing a Groundwater Protection Strategy that is both fair and equitable and that would protect the public health and the integrity of groundwater and surface watersheds from the effects of groundwater contamination.

Other jurisdictions throughout the country have developed, and in some cases enacted, groundwater or well-head protection policies or strategies. A table of strategies and legislation from local jurisdictions that are comparable to Montgomery County is presented as Appendix 10. The table illustrates the aspects of these policies or ordinances that the Work Group deemed to be important to Montgomery County.

To protect the public health, the environment, and the quality of life of its citizens, the County must address groundwater protection.

## ISSUES

### Prioritization of the Issues

Groundwater protection encompasses a wide array of issues, and therefore, first task the Work Group faced was to list and prioritize the issues that are most important to groundwater protection in Montgomery County. During the first meeting, the following issues were addressed and evaluated:

1. Data collection and analysis issues, such as reviewing data on existing or potential sources of contamination, for establishing a County groundwater baseline for quantity and quality parameters.
2. Regulatory issues, such as promoting the need for legislation and zoning changes, to protect recharge zones **BEFORE** water quality and/or quantity problems appear, and to improve/preserve recharge areas as development encroaches on these areas.
3. Education and public outreach issues, such as assessing the nature of individual effects, establishing systematic programs; helping residents understand their water supply, providing individuals, organizations, businesses and municipalities with information on the steps that they can take to preserve and restore water resources, and promoting environmentally friendly products as substitutions for products that adversely affect the environment.
4. Financial issues, such as identifying funding/resources, including environmental elements in contracting and budgeting, establishing financial incentives for water-use efficiency, and evaluating the need for special assessments.



The Work Group discussed the various aspects of each of these issues within each of these subject areas and voted to prioritize and limit the list as follows:

1. Establishment of baseline groundwater conditions in the County and of a continuing monitoring program.
2. Protection of critical groundwater recharge areas **BEFORE** (*emphasis added by the Work Group*) water quality and or quantity problems appear.
3. Education and public outreach on general and specific groundwater issues.



The Work Group evaluated each of these issues, and developed the recommendations that are presented in the sections that follow.

### Establishment of Baseline Groundwater Conditions

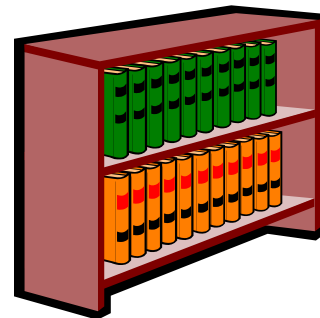
While a number of scientific hydrological and geological studies of water and groundwater in Montgomery County have been conducted, there is not a current, comprehensive, quantitative, study of the County's groundwater resources that would provide an understanding of current conditions and form the basis for developing meaningful groundwater protection programs. In



order to gain the understanding necessary for preserving and protecting the County's groundwater, the Work Group believes that County Groundwater Baseline Conditions need to be established.

The Work Group discussed various issues related to the establishment of baseline conditions and to the parameters that should be included. The discussions focused on:

1. The availability of existing data, such as Maryland Geological Survey and USGS reports on Montgomery County geology and groundwater resources.
2. The demand on groundwater resources in western Montgomery County. The Work Group believed that establishing baseline conditions in this area should have a high priority, since so many people in that region rely on groundwater.
3. The level of detail needed in the initial review of data for establishing existing and potential sources of contamination. It was decided that the review should consider operations and maintenance practices, at urban commercial institutions and industrial facilities, agricultural practices, the review of the record of illegal dumping and chemical spills, and establishment of an inventory of existing subsurface contamination.
4. The need for defining the relationship between groundwater recharge and surface water baseflow in Montgomery County.
5. Sampling of groundwater for chemical analyses:



- Frequency, -- which wells would be sampled, and how often (quarterly, yearly, or at some other interval)?
- The size of the sample set, -- what would be the number of wells that form a scientifically valid representative sample of the County's groundwater?
- Analytes, -- what should be the chemicals of concern, and which surrogates should be used?

After discussing these issues, the Work Group made the following recommendation.

## Baseline Conditions Recommendation

The Work Group recommends that the Montgomery County Department of Environmental Protection devise and implement a statistically defensible groundwater monitoring program for the County.

The program should initially obtain sufficient data for a one-time comprehensive assessment of the County's groundwater conditions. This initial sampling program will establish the County's groundwater baseline conditions.

Once the County's groundwater conditions are established, the County should undertake periodic monitoring program for assessing any changes that may occur in these conditions over time.

The available demographic, topographic, geologic, drainage pattern, land use and contamination information should be reviewed and used to screen and categorize areas based on similar demographic and environmental factors, and to determine areas that are similar and may, in fact, be representative of one another. This approach would reduce the number of wells to be sampled and therefore reduce costs of sampling and analysis.

Other cost-saving measures that would not significantly affect the collection of sufficient data for establishing and monitoring baseline conditions include:

1. The use of surrogate sites such as streams and springs to further reduce the number of wells to be sampled, and
2. The use of surrogate compounds to reduce the number of chemical constituents that must be determined by laboratory analyses.

A potential approach that the County might use to establish and monitor baseline groundwater conditions is included as Appendix 11.



The data collected during this program will be utilized in determining critical recharge areas, and maintained, updated and disseminated as discussed in the Public Education and Outreach section later.

## Education and Public Outreach

Many of the conflicts listed in the opening section of this report could be averted by informing and educating the public. Montgomery County currently has many environmental outreach and public education programs; however, of the many messages that are being sent, some are conflicting regarding budget and staffing priorities and groundwater protection and usage. Even with these problems, education and outreach are often the most cost effective means of environmental protection.

The Work Group discussed various approaches regarding educating the public about groundwater protection and implementing outreach about important groundwater issues. The fundamental issues that were addressed by the Work Group were:

1. Prioritizing the most important education and outreach issues regarding groundwater and groundwater protection.
2. Evaluating whether or not different messages should be sent to well users vs. the general public.
3. Providing guidance about whether or not there should be more frequent water quality testing of domestic supply wells.
4. Providing recommendations regarding groundwater quantity issues.

After discussing these issues, the Work Group made the following recommendation.

## Education and Public Outreach Recommendation

1. The County needs to develop a two-tiered groundwater protection education and outreach program; one for the general public, another specific to groundwater users.
2. The messages should be incorporated, whenever possible, into existing programs. For example, existing public school science and environmental curricula can incorporate information about groundwater.
3. After the Baseline Monitoring is complete, the County should disseminate that information and establish guidelines for education. For example, contaminated areas or critical recharge areas that are identified as high risk during the monitoring should be highlighted and brought to the attention of the public.
4. The Council of Governments and Maryland State drought management plans should be reviewed by DEP staff and optimal sections should be incorporated into the final strategy. A comparative matrix of the two plans is provided in Appendix 12.
5. Educational tools from the Groundwater Protection Council, the USEPA, the Groundwater Foundation, the National Groundwater Foundation, and others should be reviewed and, when deemed appropriate, adopted and utilized.
6. For users of groundwater DEP should prepare a special brochure that explains the source(s) of groundwater and identifies what affects the resource, as well as details of recommended guidelines for testing. The brochure should be given to settlement attorneys and real estate agents for distribution during the transfer of real estate.
7. DEP should propose guidelines that recommend voluntary disclosure of well water conditions, appropriate to the risk identified for the site from the baseline monitoring. In addition, the Work Group reached consensus that there was a need for more frequent testing of well water, but determined that there was insufficient information to recommend specifics.
8. Non-technical versions of this report and the final Groundwater Protection Strategy should be made available in both electronic and hardcopy form, explaining the reasons for the development of the strategy and its goals.



## Protecting Recharge Areas

Citizens of Montgomery County who depend on groundwater generally do not have an easily obtainable or cost-effective alternative source of water. In times of drought, knowledge of the baseflow conditions of streams is crucial to the implementation of the County's Stream Protection Strategy. Therefore, knowledge and understanding of the mechanisms affecting groundwater recharge in Montgomery County is critical to protecting groundwater users and stream baseflow conditions.

Recharge occurs virtually everywhere that there is no impervious surface cover. The current effort to establish a County groundwater table map in the County's GIS system (anticipated completion: end of calendar 2001), when overlaid with various other GIS maps such as topography, impervious surface, parkland etc. will allow a first cut at determining the location of critical recharge areas. In addition, the County has voluminous chemical and physical groundwater data from a few select locations (solid waste facilities, County development projects, former WSSC sites, etc.). However, these data are not in any unified form or format. During the fall 2001, some of the more readily convertible forms of these data will be integrated with the GIS.

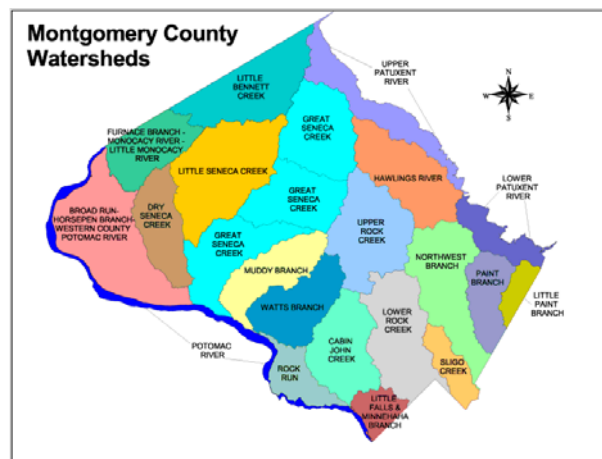
Groundwater protection may involve many potential land-use, property-rights, and zoning issues.

The Work Group discussed various approaches to protecting groundwater recharge areas. The fundamental issues that were addressed were:

1. The need to develop the criteria that define a critical recharge area.
2. Methods of protecting a critical recharge area.

The Work Group believes that the following criteria should be used to define a critical recharge area:

1. Groundwater is the primary source of water supply within that recharge area.
2. Adequate groundwater flow is required for a biological resource (that a change in baseflow quantity or quality results in a significant change of aquatic organisms and stream quality). This criterion would be used only in the case of streams determined to be of good quality by the County's Environmental Assessment.
3. There is evidence of little or no existing contamination of an area's groundwater, and that area is at risk due to development or land use trends.
4. Groundwater conditions, if protected, show a high potential for maintaining high quality, or improvement.





The Work Group also believes that other pertinent factors may be identified during the baseline evaluation and may need to be included in the delineation and protection of critical recharge areas.

After discussing these issues, the Work Group made the following recommendation.

## Recharge Protection Recommendation

It is recognized by the Work Group that its suggestions for the protection of critical recharge areas are best implemented by departments, commissions and agencies other than DEP. With this understanding, the Work Group recommends that DEP work with the appropriate agencies, commissions and departments, where appropriate, to take the following steps to protect critical recharge areas:

1. A Baseline Groundwater Study should be conducted and the results used to prioritize potential recharge areas. This baseline study should be along the lines of the example presented in Appendix 11 and begin immediately.
2. A combination of guidelines and regulations should be developed by the appropriate authorities to protect critical recharge areas.
  - Guidelines should focus on management practices such as Integrated Pest Management, Pollution Prevention, Soil Conservation and Water Quality Plans, Nutrient Management Plans, limits to impervious surface (stormwater management plan – recharge; the County should develop guidelines for increasing infiltration and reducing impervious surface in the urban areas of the County), and public outreach.
  - Regulations could include, but not be limited to; limiting land uses consistent with master plans, zoning laws, wellhead protection laws and zoning overlays.
3. The criteria established will serve as the basis for prioritizing the protection of critical recharge areas.
4. Protection measures should be integrated into existing land preservation programs such as the Rural Legacy, and Legacy Open Space Programs.
5. Some version of the State Model Ordinance for Wellhead Protection (Appendix 13) should be implemented.



The Work Group believes that all of these recommendations can be incorporated into the existing processes used for developing and implementing zoning and master plans.